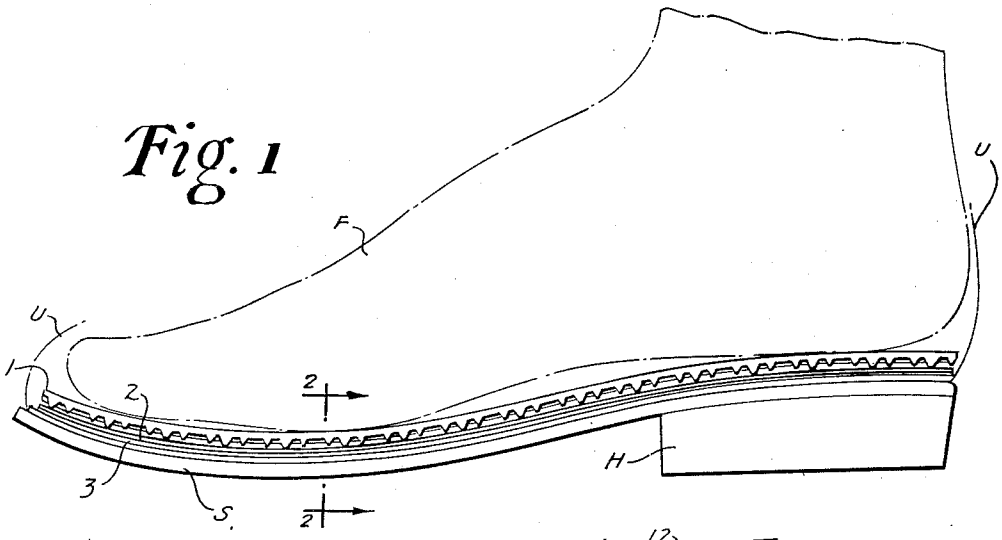
Oct. 21, 1958 M. K. ANDERSON 2,856,771

SYMPTOMATIC IMPRINTING INSOLES AND SOLE PRINTING PACKS

Filed Aug. 16, 1955 2 Sheets-Sheet 1

Fig. 1



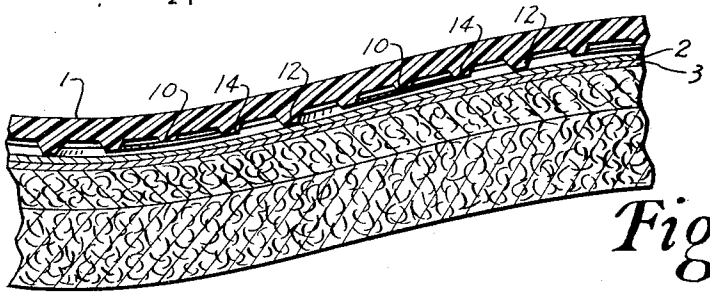


Fig. 2

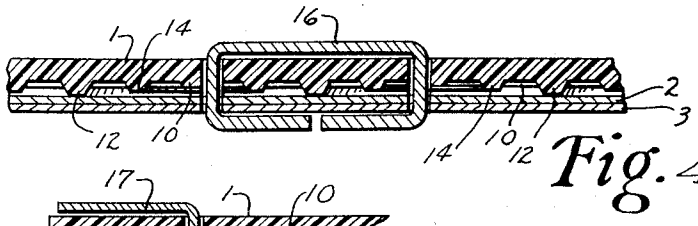


Fig. 4

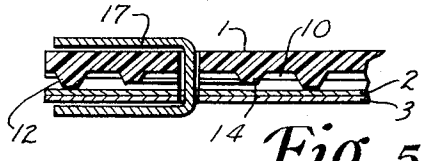


Fig. 5

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SYMPTOMATIC IMPRINTING INSOLES AND SOLE PRINTING PACKS

Filed Aug. 16, 1955 2 Sheets-Sheet 2

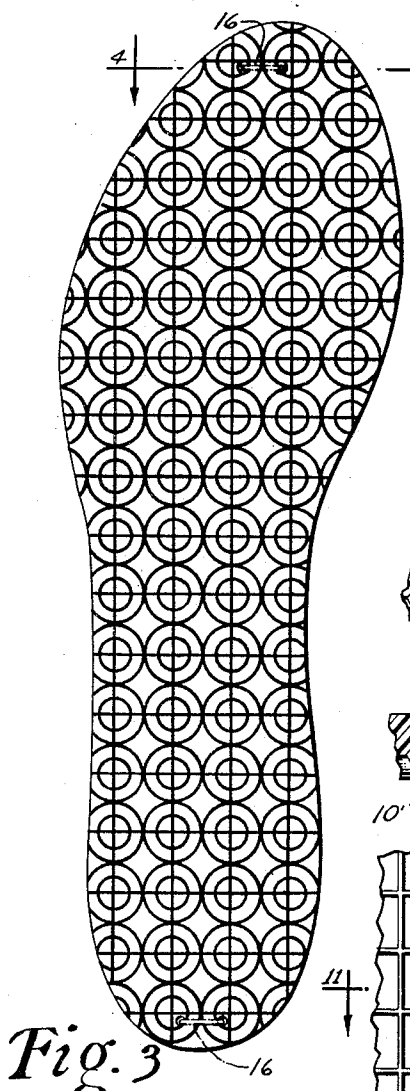


Fig. 3

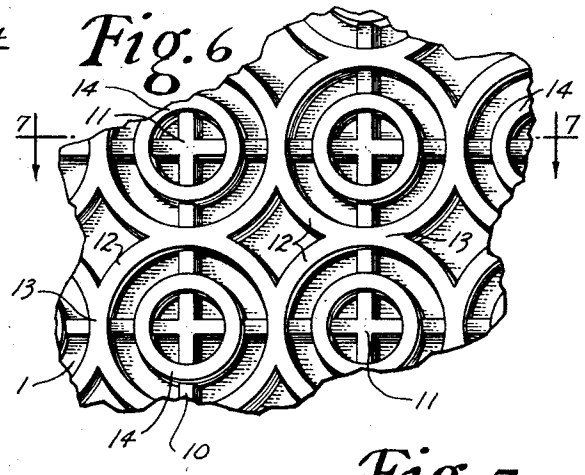


Fig. 6

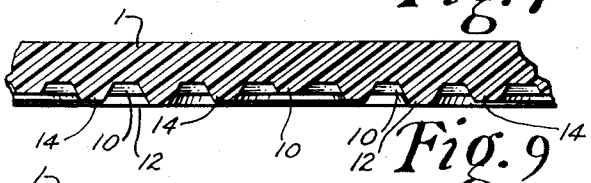


Fig. 7

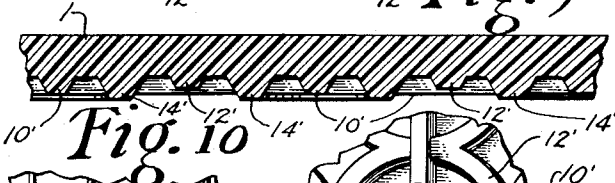


Fig. 9

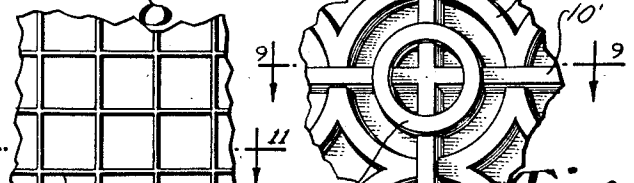


Fig. 10

Fig. 13

Fig. 8

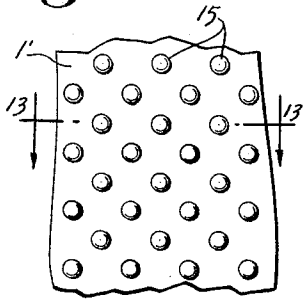


Fig. 12





Fig. 14

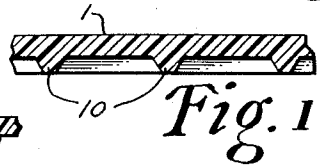


Fig. 11

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2,856,771

SYMPTOMATIC IMPRINTING INSOLES AND SOLE PRINTING PACKS

Maurice K. Anderson, Seattle, Wash.

Application August 16, 1955, Serial No. 528,712

4 Claims. (Cl. 73—172)

The present invention relates to an imprinting insole intended principally for chiropodial use in determining the pressure distribution between a particular foot sole and the upper surface of a particular shoe sole, especially for the purpose of locating pressure concentration areas.

The principal object of the invention is to provide a chiropodial symptomatic device which will indicate very accurately the comparative contours of a foot sole and of the inner surface of the sole of a shoe in which the foot is fitted, under normal conditions of use, and which will provide a permanent record of such comparison. In accomplishing this object it is a further object to provide a sole printing pack incorporating an imprinting insole which can be placed between the upper surface of the shoe sole and the foot sole for the purpose of recording their comparative contour relationship.

A more specific object is to provide a sole printing pack which can be inserted quickly in a shoe, can be used for printing by manipulation of a foot wearing the shoe in normal fashion, and can be removed easily and quickly from the shoe.

Another object is to provide such a sole printing pack which will afford a precise and clear imprint that can be interpreted easily for the purpose of indicating the pressure distribution in general and the pressure concentration areas in particular of the foot sole and shoe sole upper surface combination. For achieving this object it is an object to provide unique and effective types of relief printing surfaces which will produce such a readily interpretable imprint. It is particularly an object not only to indicate pressure concentration areas by use of such relief printing surface patterns, but to establish the relative degrees of pressure exerted in the various pressure concentration areas.

A further object is to obtain the results indicated by the use of inexpensive devices which can be used repeatedly without loss of accuracy and which will enable permanent records to be made with minimum expense.

It is another object to provide an article which can be used for the aforementioned purposes and which will produce an imprint immediately without further processing such as would be required in taking an X-ray photograph, for example.

Representative devices shown in the drawings which are capable of accomplishing the objects discussed above incorporate a foot sole printing pack including an imprinting insole of pliable elastomer material and foot sole outline having on one surface a relief printing pattern which preferably includes a repetitive geometric figure. One or more components of such repetitive figure may project more than the other components of such figure. Such relief printing pattern has a carbon paper sheet cover and the coated side of the carbon paper in turn has an imprint recording sheet placed next to it. The carbon paper sheet and the imprint recording sheet are secured to the insole by suitable means such as a bent clip penetrating these components at the toe and the heel.

Figure 1 is a side elevation view of a foot in phantom, of a shoe sole and heel and of a sole printing pack interposed between such shoe sole and the foot. Figure 2 is an enlarged longitudinal sectional view through a portion of such shoe sole and sole printing pack taken on line 2—2 of Figure 1.

Figure 3 is a bottom plan view of the preferred type of imprinting insole incorporated in the sole printing pack, and Figure 4 is a transverse sectional view through the toe portion of a sole printing pack incorporating the imprinting insole shown in Figure 3 as viewed from line 4—4 of that figure. Figure 5 is a longtiudinal sectional view through the toe portion of a sole printing pack showing a type of construction alternative to that shown in Figure 4.

Figure 6 is an enlarged fragmentary bottom plan view of an imprinting insole having a preferred type of relief printing pattern, and Figure 7 is a vertical sectional view through such imprinting insole taken on line 7—7 of Figure 6.

Figure 8 is an enlarged fragmentary bottom plan view of an imprinting insole showing an alternative type of relief printing surface, and Figure 9 is a further enlarged sectional view through such imprinting insole taken on line 9—9 of Figure 8.

Figure 10 is a fragmentary bottom plan view of an imprinting insole showing a different type of relief printing pattern, and Figure 11 is a further enlarged fragmentary sectional view of such insole taken on line 11—11 of Figure 10.

Figure 12 is a fragmentary bottom plan view of an imprinting insole showing still a different relief printing pattern, and Figure 13 is an enlarged fragmentary transverse sectional view through the imprinting insole on line 13—13 of Figure 12. Figure 14 is a similar enlarged fragmentary sectional view taken on the same line 13—13 of Figure 12 but illustrating a somewhat modified type of relief printing pattern.

It has been found that in many instances unevenly or improperly distributed pressure over the sole of the foot in standing or walking is a symptom of chiropodial ailments. To ascertain the presence of such symptoms, therefore, in order that corrective measures may be taken by any desired expedient, such as by the use of devices enable the pressure on the foot sole to be properly distributed, the present symptomatic imprinting insole and sole printing pack has been devised. By its use a permanent record may be made of the pressure distribution between a particular foot sole and the upper surface of a selected shoe sole which will indicate the comparative contours of such foot sole and shoe sole surfaces. From the record of pressure distribution thus obtained the contour of the shoe sole's inner surface may be altered by and desired expedient, such as by the use of devices shown in my prior Patents Nos. 2,352,170, 2,235,821 and 2,288,665, for example.

While the purpose of the present invention is simply to reveal the symptom of improperly distributed foot sole pressure, the preferred type of device may be designed to produce a record which can be correlated readily with a corrective device by which the contour of the shoe sole's upper surface can be changed in order to produce the type of pressure distribution desired on the foot sole. It should be understood, however, that the utility of the present device is not limited by providing a record of a type which will serve as a guide in the adjustment or formation of only a particular type of corrective contour producing appliance.

The essence of the present invention resides in providing a sole printing pack which is sufficiently compact so that it can be inserted between the upper surface of a shoe sole and the sole of a foot received within the shoe and which

will produce an accurate, precise and clearly legible permanent record of the pressure distribution on the foot sole produced by the weight of the shoe wearer when standing or walking in normal fashion. Such permanent record is produced as an imprint by a printing type of process. When the foot has been removed from the shoe, the printing pack may be removed easily and the printed record corresponding to the pressure distribution on the foot sole is available for immediate study.

The sole printing pack includes three principal components, namely a symptomatic imprinting insole **1** which is the principal component, second, a printing sheet which may be a carbon paper cover sheet **2** for the imprinting insole, and, third, an imprint recording sheet which may be a sheet of plain paper **3** disposed next to the coated side of the carbon paper sheet. As will be discussed, the printing pack may incorporate additional components if desired, and the three essential components may be disposed in different relationships.

When a sole printing pack is placed within a shoe, it will be inserted in the same manner as a conventional loose insole, a typical arrangement being shown in Figure 1. There the sole printing pack is shown as being placed within the shoe including the sole S, the heel H and the upper U shown in phantom. The sole printing pack is arranged with the imprinting insole **1** on top for direct contact of the foot F with its plain back surface. The printing surface faces downward and the carbon paper cover sheet **2** is next to it with the imprint recording paper sheet **3** beneath it.

The most important component of the sole printing pack is the symptomatic imprinting insole **1**. This insole must be capable of fitting the foot sole contiguously by readily changing its contour under pressure so as to reflect accurately the comparative contours of the foot sole and the inner surface of the shoe sole. Moreover, it must be capable of producing on the imprint recording sheet by means of the carbon paper cover a sharp and clear impression indicating the distribution of pressure on the foot sole. It is therefore preferred that the imprinting insole sheet be of thin pliable elastomer material sufficiently yieldable to conform accurately to the contour of the foot sole and the upper surface of the shoe sole, and yet sufficiently resistant to compression so that its relief printing surface will produce a sharp impression. When such an imprinting insole is made of rubber material, for example, it is preferred that it have such hardness as to give a durometer reading of 65 to 85.

The drawings have illustrated the imprinting insole **1** as being the upper member of the printing pack, and having a relief lower printing surface. It is quite possible, however, to provide a printing pack in which the imprinting insole would be disposed below the imprint recording sheet and the relief printing surface would face upward. In that case it would be necessary for the imprint recording sheet or a sheet above it to be of a construction similar to that of the imprinting insole described above, so that it could conform properly to the contour of the foot sole. Such an upper sheet, therefore, should be made of thin, pliable elastomer material in order to afford proper pressure on the imprint recording surface and the carbon paper sheet against the upwardly facing relief printing surface of the imprinting insole.

The precision with which the pressure distribution indicating imprint is made on the imprint recording sheet and the pattern in which it is produced will depend upon the pattern of the relief printing surface. Any of a variety of patterns may be selected for such a printing surface, but the pattern should be such that the composite area of the printing surface projection is a small fraction of the total area of the printing surface. Such printing surface preferably has an outline conforming to that of the foot sole and the shoe sole, although in some instances a sufficient pressure distribution record may be afforded if the printing surface does not extend over the toe portion of the shoe sole and foot sole, but encompasses only the ball of the foot, the arch and the heel portions. Such restriction of printing surface projection area is necessary in order to produce a sharp pressure distribution imprint instead of merely a smudge on the imprint recording sheet.

Adjustment of a shoe sole contour adjusting device such as disclosed in my patents mentioned above is facilitated by selecting a pattern for the relief printing surface of the imprinting insole which corresponds to the adjustable elements of such a foot foundation. The pressure distribution imprint obtained by use of the present device can, however, readily be interpreted to enable other types of shoe sole contour establishing devices to be shaped properly even though the pattern of the relief printing surface corresponds generally to the pattern of the adjusting devices on such a foot foundation. Conversely, the adjusting elements of such a foot foundation can be adjusted accurately, though not as readily, by reference to the pressure distribution imprint obtained by the use of an imprinting insole employing the principles of the present invention but having a relief printing pattern which does not correspond to the arrangement of the adjustable elements in such a foot foundation.

Whatever type of relief printing surface pattern is utilized, it is also preferable in most instances to employ a pattern some portions of which project to a different degree than other portions so that the relative pressures in different pressure concentration areas will be indicated. The relief printing pattern may therefore be composed of repetitive figures, each figure of which incorporates one geometric pattern superimposed upon another geometric pattern, that is, the first geometric pattern will project to a greater extent than that on which it is superimposed, so that the superimposed projections will mark and must be compressed before the projections on which they are superimposed will mark.

It has been found that three levels of projection are desirable in the relief printing surface pattern, although reasonably satisfactory results can be obtained if all the projections are the same height. Where the height of the projections differs, the difference in projection height should be quite small because of the inherent resistance to great deformation of the elastomer material of which the printing pattern projections are made. The amount of projection of the various printing surface pattern components should not differ by more than a few thousandths of an inch. Thus, for example, the projection of the lowest level may be 0.022 of an inch, the projection of the next higher level may be 0.026 of an inch, and the highest level may be 0.030 of an inch in the printing pattern. The height of the highest projection must be several times as great as the difference between its height and that of the next lower projection, because otherwise the highest projection would not be deformed sufficiently to enable a lower projection to mark whatever the degree of pressure concentration might be.

Considering the specific example given, it will be evident that in order to enable the lowest projection having a height 0.022 of an inch to mark, it will be necessary for the highest projection to be deformed so as to reduce its height from 0.030 of an inch substantially to 0.022 of an inch, a reduction of 0.008 of an inch. Thus, it would be necessary for the height of the highest projection to be reduced approximately twenty-seven percent of its height. It is desirable, therefore, for the projecting pattern elements of the relief printing surface to be made of material which will be sufficiently resistant to deformation under pressure so as to make a sharp and clear imprint but which at the same time will be sufficiently yieldable to enable higher projections to be compressed sufficiently so that appreciably lower projections also can exert sufficient pressure to make a clear mark.

It will be appreciated that the problem of selecting the proper material for an imprinting insole having an integral relief printing surface is further complicated by the

requirement that the material selected for construction of the insole as an integral unit must have the resistance and yieldability characteristics discussed above, which are desirable for an effective printing surface, while at the same time being sufficiently pliable to conform accurately to the contour of the foot sole and the inner surface of the shoe sole. For these purposes the characteristics of the material can be supplemented by proper selection of the thickness of the imprinting insole, its thickness preferably being between one-sixteenth and one-eighth of an inch, and the selection of the extremity area, degree of projection and shape of cross section of the printing pattern projections. It is preferred that the area of the printing pattern projection extremities be small so as to produce a sharp impression and that such projections taper outwardly to deter bending of them under pressure.

A preferred type of relief printing surface pattern having the characteristics discussed above is shown best in Figures 3, 6 and 7. This printing pattern incorporates basically a check pattern **10** on which circles are superimposed centered at the check pattern intersections **11**. To enable the entire printing surface area to be covered with the circle figures it is preferred that the circles be tangential, as are the circles **12** at **13**. Additional circles **14** concentric with the tangential circles **12** may be provided within each of such tangential circles. The radius of the inner circles preferably is at least half of the radius of the tangential circles and may be slightly greater. The cross section of both the linear and circular projections, as shown in Figure 7, is tapered outwardly.

In providing a combination check and circle pattern as described above it is preferred that at least one circle in each figure of the pattern, and perhaps both, be superimposed upon the check pattern. In the relief printing surface pattern shown in Figures 6 and 7 the inner circle or smaller circle pattern is superimposed upon the check pattern and the tangential circle or larger circle pattern **14** is superimposed on the inner circle pattern **12**. While the difference in projection of the figure components shown in Figures 6 and 7 is exaggerated, for purposes of illustration, such components should have proportions such as discussed above. Thus the projection of the check pattern could be 0.022 of an inch, the projection of the small circle components of the pattern could be 0.026 of an inch, and the projection of the tangential circle components of the pattern could be 0.030 of an inch.

The relief printing surface pattern shown in Figures 8 and 9 is the same in plan form as shown in Figure 3 and differs from the pattern shown in Figures 6 and 7 in the relative degrees of projection of the pattern components. In this instance the check pattern **10'** is superimposed on the tangential circle pattern **12'** so that the precise points of tangency of these circles are covered by the check pattern. The pattern of small circles **14'** is then superimposed on the check pattern. The relative heights of such projections may be the same as before, the highest projections being 0.030 of an inch, in the form of the circles **14'**, the intermediate projections of the check pattern being 0.026 of an inch, and the lowest projections of the tangential circles **12'** being 0.022 of an inch. Again, as shown in Figure 9, each projection component is tapered in cross section to its extremity.

While the difference in height of the projection components in the various figures of the printing pattern is desirable to enable differences in pressure in various pressure concentration areas to be evaluated, a reasonably informative pressure distribution pattern imprint can be obtained by use of a printing surface pattern having projections all of the same height. Such a printing surface pattern is represented, for example, by the simple check pattern **10** shown in Figures 10 and 11. The projection of such a check pattern may be between 0.010 of an inch and 0.040 of an inch, for example, the height of the projections being much less important where they are all the same height.

Another example of a simplified relief printing surface pattern is the polka dot pattern formed by the buttons **15** provided on the insole **1'** of Figure 12. Such buttons may be of domed contour so that differences in pressure may be indicated to some extent by the size of the circular imprint produced by their extremities, depending upon the extent to which they are flattened by the pressure on them. Such buttons may be all of the same height as shown in Figure 13, or the buttons in alternate rows, designated **15'** in Figure 14, may project farther than the other buttons. Such pattern of higher buttons superimposed upon the pattern of lower buttons may be altered in any desired manner.

Irrespective of the particular type of relief printing pattern provided on the imprinting insole, such insole may be incorporated in the same manner in a sole printing pack. In fact, it will be evident that printing patterns considerably different from the representative patterns shown in the accompanying drawings and discussed above may be used. If the imprinting insole **1** is to constitute the upper member of the pack, it is only necessary to provide a carbon paper sheet or printing sheet and an imprint recording sheet. If the carbon paper sheet **2**, shown in Figures 1 and 2, is placed next to the printing surface of the insole, its coated side will face away from the printing surface, and the imprint recording sheet **3** will be placed next to the coated side of the carbon paper sheet. Alternatively, the imprint recording sheet could be placed next to the imprinting insole, and the carbon paper sheet could be placed on the side of such imprint recording sheet opposite the insole, with its coated side facing the imprint recording sheet and the imprinting insole.

The imprint recording sheet will ordinarily be simply plain paper. It is preferred that all the components of the pack be of corresponding sole outline and be secured together. The pack components may conveniently be interconnected by a strip or wire staple **16** penetrating the toe portion and the heel portion of the components as shown in section in Figure 4 and in phantom in Figure 3. Alternatively, a half staple **17** shown in section in Figure 5 of strip or wire material may interconnect the toe portions and the heel portions of the components of the pack. Such an interconnecting member should be easy to remove as well as to apply, and such a staple or half staple is formed of soft aluminum wire and is satisfactory where registering holes are provided in the sole printing pack components to assist in placing them in registry.

The components used for the sole printing pack may be varied depending upon the character of the relief printing surface and perhaps the foot size and weight of the person for whom the sole imprint is desired. Thus a lighter print may be obtained if an additional sheet of paper is interposed between the imprinting insole **1** and the carbon paper sheet **2** shown in Figures 2, 4 and 5. The weight of carbon paper sheet and the character of its coated surface will also govern the character of the imprint obtained. If the imprinting insole is used as the lower component of the pack, it is desirable to apply to the upper side of the pack a thin pliable elastomer material sheet which would overlie the imprint recording sheet. Alternatively, it may be found to be sufficient simply to use an imprint recording sheet of relatively heavy paper.

Such variation in the composition of the sole printing pack will not alter the principles incorporated in utilization of the present invention and the number, weight, material and arrangement of the several sole printing pack components may be selected in accordance with the desires and requirements of the individual user. Whatever the composition of the sole printing pack, however, its composite thickness should not be so great

as to prevent it being fitted comfortably like a loose insole within the shoe of a person whose sole imprint is desired. The various components of the sole printing pack will be assembled and preferably secured together, such as in the manner discussed above, before being inserted in the shoe. Immediately after the sole imprint has been taken by the person standing or walking in the shoe with the sole printing pack in it, the foot and printing pack may be removed from the shoe. The imprint recording sheet **3** may then be removed from the pack by tearing it off or removing the staples, if desirable, so that it is available for immediate examination.

After such use a new imprint recording sheet is incorporated in the pack, either with or without a new carbon paper sheet as may be desired. These components are then preferably secured together so that the pack is ready for obtaining a further imprint. Such imprinting insoles of various sizes can be stored separately indexed according to size until it is desired to use them, or packs of different size ready for use can be stored and similarly indexed according to size. Also, the imprints taken can be suitably indexed and stored for each particular person to be used for future reference if desired.

I claim as my invention:

1. A symptomatic imprinting insole comprising a sheet having a relief printing surface including a pattern having components which project different amounts.

2. A symptomatic imprinting insole comprising a sheet having a relief printing surface including a repetitive regular figure pattern, each figure of which has components projecting different amounts.

3. A symptomatic imprinting insole comprising a sheet having a relief printing surface including tangential circles and concentric circles within said tangential circles, the circles of one type projecting farther than the circles of the other type.

4. The symptomatic imprinting insole defined in claim 3, in which the tangential circles project farther than the concentric circles within the tangential circles.

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